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Economics of Soil Conserving Practices on Muskingum and Associated Soils In Ohio

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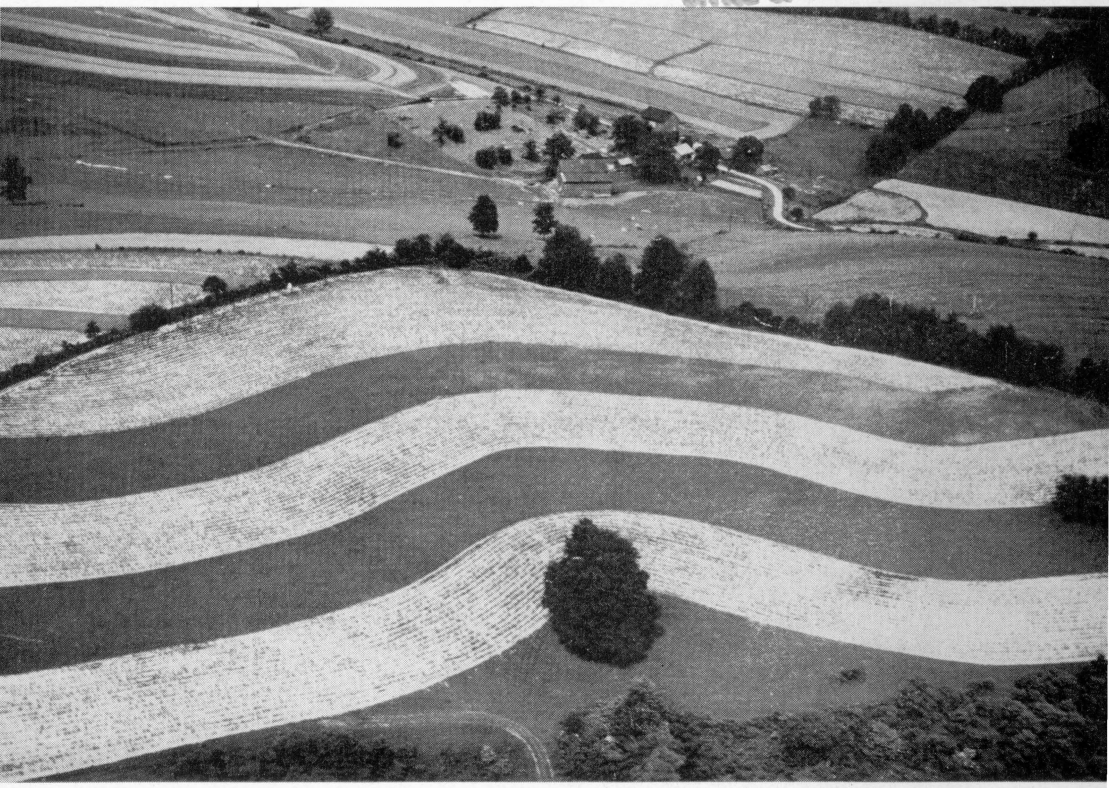

OHIO AGRICULTURAL EXPERIMENT STATION • • Wooster, Ohio

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The Cover:

Shown here are strips and farmstead on the O. C. Temple farm north of Danville, Ohio. Photo was taken by W. H. Lathrop.

ECONOMICS OF SOIL CONSERVING PRACTICES ON MUSKINGUM AND ASSOCIATED SOILS IN OHIO

R. H. BLOSSER

INTRODUCTION

Soil conservation has received considerable emphasis during the last two decades. As a result many farmers ask the question, "Will more conservation practices increase net income?" This question arises because the adoption of additional conservation measures often requires major changes in present farm organization and methods of production. Many times these changes alter receipts, expenses and finally net income. On many farms additional conservation practices also affect the present demands for labor, power and capital.

The economics of soil conservation depends upon the period of time considered. In many cases returns from the short-time point of view are different from the benefits over a longer period of time. Individual farmers are usually interested in soil conservation for a shorter period of time than society. Therefore, the most profitable application of practices for the farmer may not be the most desirable for society.

A few farmers may apply more conservation measures because they believe they should conserve the soil for future generations. However, most farmers adopt conservation practices only to the point where they think net income will be maximized for a certain period of time. In some cases this may not include enough soil conservation practices to maintain the farm permanently as a producing unit.

The adoption of soil conservation practices may change receipts and expenses in several ways. Individual practices such as terracing, liming and fertilizing increase current operating expenses which may not be completely recovered for several years. Costs are increased further when additional livestock and buildings are used to market more forage. Receipts from more meadows will depend largely upon the way the additional forage is used. Net income from the adoption of conservation practices is influenced by: (1) the amount applied, (2) type of soil, (3) type of farming, (4) efficiency of forage consuming animals, (5) relative prices of crops and livestock, and (6) the period of time considered.

OBJECTIVES

The purpose of this study is to consider the economics of soil conservation for Muskingum and associated soils. These soils cover about one-half of southeastern Ohio. They are usually steep with slopes ranging from 10 to 30 percent. Erosion is a serious problem on most of the cropland. In many cases one-half to three-fourths of the original topsoil has been lost because of past land management.

Detailed objectives of this study are to measure the effects of two groups of conservation practices on (1) crop production, (2) farm organization, (3) livestock numbers, and (4) farm income.

METHOD OF STUDY

Net income from a group of soil depleting practices will be compared with two groups of soil conserving practices. One group of conserving practices includes a four year rotation of corn, wheat and two years of alfalfa-grass meadow supplemented with contour strip cropping. The other group of conserving practices includes a rotation of wheat and three years of alfalfa-grass meadow.

Costs and returns were determined by means of farm budgets. This procedure permitted holding constant such factors as size of farm, production efficiency, type of livestock, prices and management. By holding all factors constant except soil conservation practices, receipts, expenses and net income were calculated for farms that differed only in the amount of conservation measures applied.

Calculations were based on groups of conservation practices because most farmers apply several practices at the same time. No attempt was made to evaluate the economics of individual practices because of the difficulty of calculating costs and returns when joint relationships exist. Even if the economics of single practices could be determined accurately, most farmers would be interested in the net returns from applying a combination of practices.

Receipts, expenses and net income for the group of soil depleting and the two groups of soil conserving practices will be compared for three types of farming: (1) a crop farm with no livestock, (2) a dairy farm with two different levels of milk production, and (3) a beef cattle farm. Economic returns will be discussed in terms of (1) income per farm and (2) income per hour of labor. Returns per hour of labor were calculated to show whether soil conservation practices increased net income because of (1) heavier applications of labor, or (2) higher returns per hour of labor. In some cases conservation practices may increase net income through higher hourly returns, either with the same,

or a larger amount of labor. In other cases conservation measures may increase income because of heavier applications of labor, but a smaller average return per hour.

SOURCE OF DATA FOR CALCULATIONS

Data on land use, fertility practices, crop yields, livestock numbers and production were collected on 75 farms in Coshocton County during 1952. However, only 55 farms were used to furnish production data for this study. Twenty farms were discarded to make the data as homogeneous as possible. Some were rejected because they did not have the desired soil type; a few were not used because the operator was not farming the land to capacity; several were discarded because they did not have the prevailing four year rotation of corn, small grain and two years of meadow. According to soils maps prepared by the Soil Conservation Service, the 55 farms were comparable from the standpoint of soil resources; all had approximately the same soil type, slope of land and degree of erosion.

Coshocton County, which is located in east central Ohio, has large areas of Muskingum and associated soils. It also has many farmers who are following the recommendations of the local soil conservation district. Fifty-one farmers out of the 75 were cooperating with this agency. Many were following all of the recommendations. A few had been following them for more than 10 years. Twenty-four farmers out of the 75 were not cooperating with the local soil conservation district. However, personnel of this agency had contacted almost all of these farmers and had rated most of them poor from the standpoint of soil conservation.

The 55 farms do not represent a cross section of farming in the county. Over three-fourths of the farms contacted were located in four northeastern townships to make soil types and farming methods as nearly comparable as possible. No farms were included on which part-time farming was followed. The main objective was to secure a group of full-time farmers, some of which were following recognized soil conserving and others soil depleting systems of farming.

SOIL DEPLETING AND CONSERVING FARMING DEFINED FOR THE PURPOSE OF THIS STUDY

In this study conservation farming is defined on the basis of recommendations made by the local soil conservation district whose goal was to reduce average annual soil losses to less than three tons per acre and maintain soil productivity at a high level. Although this agency suggested several alternative groups of conservation practices, only two

were considered to reduce repetition on many points. Since these two groups of practices represent the extremes from the standpoint of corn and meadow recommended, they should be sufficient to illustrate the main economic principles involved.

One group of conservation practices included (1) contour strip cropping, (2) a rotation of corn, wheat and two years of alfalfa-grass meadow, (3) an average annual application of 175 pounds of fertilizer per acre on the cropland and (4) improvement of the permanent pastures. Hereafter, this group of practices will be referred to as "conservation farming with corn".

The other group of conservation practices included (1) no contour strip cropping, (2) a rotation of wheat and three years of alfalfa-grass meadow, (3) an average annual application of 175 pounds of fertilizer per acre on the cropland, and (4) improvement of the permanent pastures. For identification purposes, this group of practices will be called "conservation farming without corn".

Many combinations of soil depleting practices are possible but only one was studied. The combination selected included (1) no mechanical erosion control practices, (2) red clover and timothy on first year meadows, (3) timothy on second year meadows, (4) an average annual application of 125 pounds of fertilizer per acre on the cropland and (5) no permanent pasture improvement. This combination, which included the major depleting practices found on the farms surveyed, will be referred to as "soil depleting farming".

DESCRIPTION OF THE 55 FARMS FURNISHING PRODUCTION DATA

Soil Types. Since this study was limited to Muskingum and associated soils, the principal types on the 55 farms were Muskingum and Keene. The former type covered an area roughly twice the size of the latter. These two soils could not be separated and studied individually because they often occurred together in the same field. Even if data could have been obtained for specific soils, conservation planning in this area would still have to be done on the basis of soil associations rather than a particular type.

The soils in this study are unglaciated, and have developed from sandstone and shales. They are acid in reaction except where liberal amounts of lime have been applied recently. Usually they are steep and subject to severe erosion. Muskingum soils are shallow with rock fragments. Surface water runs off rapidly and internal drainage ranges from moderate to excessive. Keene soils are not as steep as

Muskingum; therefore, the surface water runs off less rapidly. The internal drainage of Keene is less thorough than Muskingum and is classified as slow.

Land Use. The land use pattern on the 55 farms furnishing production data is shown in Table 1. These farms ranged in size from 77 to 337 acres and averaged 158. This average was larger than the county average of 135 acres because of the method of selection. None of the 55 farms had less than 77 acres although census data for 1949 showed that 28 percent of the farms in the county had less than 70 acres.

TABLE 1.—Land Use on 55 Farms Furnishing Production Data, Coshocton County, 1952

	Average Acreage for Different Size Farms				
	60-99 Acres	100-139 Acres	140-179 Acres	180-340 Acres	All Farms
Corn	10	12	16	21	15
Small grain	12	14	19	25	18
Meadow	24	34	42	59	42
Rotated land	46	60	77	105	75
Permanent pasture	23	31	52	88	50
Woods	9	15	24	45	24
Miscellaneous	5	7	9	15	9
Total	83	113	162	253	158

The four different size groups in Table 1 had the following number of farms: 60-99 acres, 6 farms; 100-139 acres, 20 farms; 140 to 179 acres, 15 farms; and 180 to 340 acres, 14 farms. On a percentage basis, the larger farms had less rotated land than the smaller farms, but more permanent pasture and woods. All of the 55 farms had a four year rotation of corn, wheat and two years of meadow. This rotation was the one most commonly found, even when the operator was not cooperating with the local soil conservation district.

Livestock Numbers. Dairying was the principal livestock enterprise on most of the 55 farms. But poultry and hogs also contributed substantially to income. Hogs were usually kept to consume the corn not fed to dairy cows. On many farms most of the poultry feed was purchased. More livestock per farm, but less per acre was kept on the larger farms.

TABLE 2.—Livestock Numbers on 55 Farms Furnishing Production Data, Coshocton County, 1952

	Average Amount of Livestock for Different Size Farms				
	60-99 Acres	100-139 Acres	140-179 Acres	180-340 Acres	All Farms
Dairy cows	10	12	14	11	12
Beef Cows	0	0	1	5	2
Ewes	8	0	5	20	7
Market hogs	28	43	31	42	37
Hens	186	189	167	149	167

Thirty-four of the 55 farmers had dairy herds ranging from 10-19 cows; four had less than five cows; and only four had 20 or more cows. On 33 farms the number of market hogs ranged from 10-49; only 15 farmers raised more than 50 market hogs per year. Twenty-nine of the farmers had flocks of poultry between 100 and 300 hens; only six had more than 400; but 19 had less than 100 hens. Beef cows and sheep were raised in small numbers. Only five farms had 10 or more beef cows, and only six had over 25 ewes.

CROP PRODUCTION DATA USED IN BUDGETARY CALCULATIONS FOR SOIL DEPLETING AND CONSERVING FARMING

Land Use. Budgetary calculations that follow are based on the crops produced on a 120 acre owner-operated farm. This size unit is typical of many farms in the county where the operator has no other source of income but farming. Census data for 1949 showed a smaller number of farms in the county as the size increased above the 120 acre group. Although many farms in the county contained less than 100 acres, this smaller size farm was not considered in this study because it was often operated by a part-time farmer.

Acreage of crops used in making calculations are shown in Table 3. The land use pattern for the rotated land was obtained from the group of farms having 100-139 acres in Table 1, page 7. The acreage of permanent pasture and woods was increased slightly above the actual figures for this group to round the total area to 120 acres. Calculations also could have been based on land use patterns for the other three groups of farms in Table 1. However, none would have represented as many farms as the 100-139 acre group.

TABLE 3.—Crop Production Data Used in Calculating Net Income for Soil Depleting and Conserving Farming

	"Soil Depleting Farming"	"Conservation Farming"	
		With Corn"	Without Corn"
Land Use			
Corn, acres	12	12	0
Wheat, acres	14	14	15
Alfalfa-grass hay, acres	0	34	45
Clover hay, acres	17	0	0
Timothy hay, acres	17	0	0
Rotated land, acres	60	60	60
Permanent pasture, acres	36	36	36
Woods, acres	17	17	17
Miscellaneous, acres	7	7	7
Total land, acres	120	120	120
Crop Yields			
Corn, bushels	46	68	——
Wheat, bushels	22	26	26
Alfalfa-grass hay			
1st and 2nd year, tons	——	2.5*	2.5*
3rd year, tons	——	——	1.5†
Clover hay, tons	1.5†	——	——
Timothy hay, tons	1.0†	——	——
Crop Production			
Corn, bushels	552	816	0
Wheat, bushels	308	364	390
Alfalfa-grass hay, tons	0	85	97.5
Clover hay, tons	25.5	0	0
Timothy hay, tons	17	0	0

*Two cuttings. †One cutting.

Crop Yields. Yields used in evaluating the economics of conservation farming were obtained from records on the 55 farms. (See Table 3, page 9). Wheat and hay yields were for 1952, but corn yields were for 1951 because the 1952 crop was not harvested at the time of the survey. Yields for the group of practices designated "soil depleting farming" are averages[1] for farms having (1) red clover and timothy meadows (2) no contour strip cropping and (3) an average annual application of 125 pounds of fertilizer per acre on the cropland.

Yields for the group of practices designated "conservation farming with corn" are averages[1] for farms having (1) alfalfa-grass meadows, (2) contour strip cropping, and (3) an average annual application of 175 pounds of fertilizer per acre on the cropland. Calculations showed that corn yields were highly correlated with the amount of alfalfa in the meadows. Part of this correlation may be attributed to contour strip cropping. This practice was found on most farms where alfalfa meadows were raised.

Yields for the group of practices designated "conservation farming without corn" could not be obtained from the data on the 75 farms. Although three of these farms had no corn, they were excluded from the group of 55 farms because they were too steep, and therefore were not comparable from the standpoint of soil resources. To determine receipts, expenses and net income when no corn was raised, the same yields were used for "conservation farming without corn" as "conservationtion farming with corn" with one exception. Since the Keene soil has poor drainage, the assumption was made that alfalfa would run out the third year and could be cut only once because the meadow would be principally timothy. Therefore, average hay yields were reduced from 2.5 to 1.5 tons per acre for third year meadows. Net income calculations for "conservation farming without corn" were based on the assumption that wheat yields for the rotation of wheat and the three years of meadow would be the same as for "conservation farming with corn". This assumption might not be valid if too much nitrogen caused an excessive growth of wheat. In this case clipping or pasturing the wheat might be necessary to protect the new meadow seeding.

Crop Production on Rotated Land. Calculations in Table 3 show that "conservation farming with corn" gave 320 bushels more grain, and 42.5 tons more hay than "soil depleting farming". Also, "conservation farming without corn" gave 470 bushels less grain, but 55 tons more hay than "soil depleting farming".

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[1]Corn and wheat yields were calculated from multiple regression equations. Therefore, it is impossible to state the number of farms included in the groups designated soil depleting and conserving farming. These equations were obtained by correlating grain yields with (1) quality of hay, (2) erosion control, and (3) fertilizer applied. If the 55 farms had been sorted into several groups to determine yields for soil depleting and conserving farming, the number of farms in most groups would have been too small to be statistically significant. Variance analysis showed that if another sample of 55 farms were taken from the same population, 95 percent of these farms would have corn yields that would vary less than 2.2 bushels from the ones in this study.

Although conservation farming might increase corn yields as much as 50 percent, total production will not increase greatly on many farms in this study because of the small acreage of corn. On some farms in Coshocton County conservation farming might reduce the acreage of corn to the point where total corn production did not increase at all, even with substantially higher yields per acre. Calculations in this study show that conservation farming would give a greater proportionate increase in total production of forage than grain. Therefore, disposition of forage becomes important if net income is to be maximized under soil conserving farming.

Pasture Production Data. Actual data on pasture production could not be obtained on the 55 farms because none of the operators had any systematic way of measuring yields in terms of milk or beef produced. Therefore, data from other sources were used to determine the carrying capacity of pastures for the 120 acre farm. The yield of rotation pasture was based on the type of hay raised. The yield of permanent pasture was calculated from unpublished experimental data for southeastern Ohio.

Calculations for "soil depleting farming" showed that only 14 animal units of livestock could be kept on the pasture and hay produced. To produce this amount of pasture required 36 acres of unimproved permanent and 34 acres of meadow pasture after making one cutting of hay. The pasture schedule for "soil depleting farming" was well balanced. Adequate amounts were provided during the summer months by pasturing meadows after the first cutting of hay. Only a couple tons of hay were needed to supplement the pasture during July and August.

Calculations for "conservation farming with corn" gave enough pasture and hay to support 20 animal units. Pasture for this amount of livestock came from 36 acres of improved permanent pasture and 17 acres of meadow pasture after the first cutting of hay. This meadow pasture came only from the strips adjoining wheat.

Contour strip cropping produced an unbalanced pasture schedule. This practice created several problems in pasturing meadows. When meadow and corn strips were next to each other, pasturing could not be done unless the meadow strips were fenced. This was seldom done by any of the farmers in this study because of the additional labor required, and the difficulty of providing water for livestock. Instead of fencing these strips a few farmers made a second cutting of hay and fed it during the summer months. This method of harvesting part of the forage was used in calculating the pasture schedule for "conservation farming with corn". Otherwise, the livestock would not have received enough

TABLE 4.—Pasture Schedule Used in Calculating Income for a 120 Acre Farm With Three Types of Farming

Type of Farming	Month							
	April	May	June	July	Aug.	Sept.	Oct.	Nov.
"Soil Depleting Farming"								
Animal units* of pasture available	0	14	17	12	13	17	14	6
Animal units of livestock pastured	14	14	14	14	14	14	14	14
Tons of hay needed to supplement pasture	—	—	—	.8	.4	—	—	—
"Conservation Farming With Corn"								
Animal units of pasture available	10	24	20	12	13	16	16	13
Animal units of livestock pastured	20	20	20	20	20	20	20	20
Tons of hay needed to supplement pasture	—	—	—	3.2	2.8	1.6	1.6	—
"Conservation Farming Without Corn"								
Animal units of pasture available	13	31	25	25	28	24	16	11
Animal units of livestock pastured	24	24	24	24	24	24	24	24
Tons of hay needed to supplement pasture	—	—	—	—	—	—	3.2	—

*One animal unit equals 1 cow or 2 head of young stock.

forage during July, August and September. According to these calculations about eight tons of hay were needed to substitute for the forage lost by not pasturing the strips adjoining corn.

For summer feeding, hay and silage are more costly than pasture, but may be the only practical alternative on many farms where contour strip cropping is followed. On some farms in this study considerable amounts of forage were lost as a feed when hay was made only once on these strips and no pasturing done the remainder of the season. On almost every farm in this study, meadow strips were pastured only when they were next to small grain. This could be done after harvesting the first crop of hay and small grain without building additional fences. However, good management would be needed to protect the new meadow seedings from over-grazing. Since new seedings should not be pastured as late in the fall as second year meadows, this method reduced some of the potential returns from second year meadows. If meadow strips next to small grain were not pastured at all, considerably less pasture would be available than the calculated amount.

Calculations for "conservation farming without corn" showed sufficient pasture and hay for 24 animal units. Pasture for this amount of livestock came from 36 acres of improved permanent pasture and 45 acres of meadow pasture taken after the first crop of hay. The pasture schedule for this type of farming was well balanced. There was no need to feed any hay during the summer months because sufficient rotation pasture was available after the first cutting of hay.

ECONOMICS OF SOIL DEPLETING AND CONSERVING FARMING BASED ON FARM BUDGET ANALYSIS

NET INCOME WHEN ALL CROPS WERE SOLD

Calculations in Table 5 show the economics of conservation farming when all crops were assumed to be sold. These computations were based on crop production data for the 120 acre farm described in the preceding section. Crop farming was not found on any of the 55 farms. Most farmers had no dependable market for hay. However, if hay were sold, calculations still showed that farming without livestock on 120 acres would not provide an adequate income for most full time operators even under conservation farming.

Capital Requirements. The amount of capital needed for the crop farm was calculated to be: $9500 for "soil depleting farming"; $9500 for "conservation farming with corn", and $9000 for "conservation farming without corn". Table 5. Less capital was needed for "conservation farming without corn" because no machinery was needed for this grain crop. Machinery investments were based on average prices for 1943-52, and the most common methods of production, except hay harvesting. On the majority of the farms studied, hay was harvested with a loader, but machinery investments and costs of operation were calculated for harvesting with a field baler. Since hay could not be sold loose, baling was necessary either in the field or after harvesting with a loader. Baling in the field was selected for cost purposes because it was a cheaper and more logical method of harvesting than using a loader and baling later. Harvesting with a loader would not require as high an investment in machinery as owning a baler.

Machinery investments for corn were based on the prevailing method of cutting with a binder and husking with a shredder. For wheat the common practice was cutting with a binder and threshing from the shock with a custom outfit. A complete line of modern farm machinery would increase greatly the capital requirements compared with the prevailing needs for raising crops. Investments in buildings

TABLE 5.—Investment, Receipts, Expenses and Net Income for a 120-acre Crop Farm With Soil Depleting and Conserving Farming

(Based on average prices for the period 1943-52)

	"Soil Depleting Farming"	"Conservation Farming"	
		With Corn"	Without Corn"
	Dollars	Dollars	Dollars
Capital Investment			
Land	2,000	2,000	2,000
Buildings and fence	3,500	3,500	3,500
Machinery	4,000	4,000	3,500
Total	9,500	9,500	9,000
Receipts			
Corn	795	1,175	0
Wheat	604	713	764
Hay	893	2,125	2,437
Total	2,292	4,013	3,201
Expenses			
Machinery	608	883	706
Lime and fertilizer	290	498	566
Seed	173	181	157
Taxes and insurance	85	85	80
Depreciation and repair of buildings	175	175	175
Interest on investment	380	380	360
Miscellaneous	75	100	100
Total	1,786	2,302	2,144
Labor Income	506	1,711	1,057
Return per Hour of Labor	.77	1.87	1.56
	Hours	Hours	Hours
Labor Required	654	917	676

and fences were based on the amount actually found on the 55 farms. Valuations for these items were probably higher than needed for a set of buildings and fences designed strictly for crop farming.

Receipts. When all crops were sold, calculations for "soil depleting farming" showed a gross income of $2292. Table 5. "Conservation farming with corn" gave a gross income of $4013, or $1721 more than "soil depleting farming." Most of this difference came from meadow crops; only $489 was due to grain, compared with $1232 for hay.

When no livestock was kept, "conservation farming without corn" gave $3201 gross income, or $909 more than "soil depleting farming." Table 5. All of this difference was due to more hay. No value was placed on permanent pasture because there was no way to market this crop without livestock.

Prices used in calculating gross receipts were averages for 1943-52. Averages for the 10 year period were used to minimize the effects of short-time changes in price relationships. Sales from corn were calculated at $1.44 per bushel and wheat at $1.96. Receipts from hay were based on the following prices per ton, baled; $21.00 for production under depleting farming; and $25.00 for soil conserving farming.

Expenses. When all crops were sold, calculated expenses were $1786 for "soil depleting farming"; $2302 for "conservation farming with corn"; and $2144 for "conservation farming without corn". Table 5. Most of the difference was due to variations in expenditures for lime, fertilizer and machinery. Overhead expenses such as taxes, repair of buildings and interest on investment were approximately the same for depleting and conserving farming.

Machinery costs were based on the amount of time equipment was used to produce crops in southeastern Ohio. They also were calculated on the assumption that machinery would be used efficiently, thereby reducing costs of obsolescence to the minimum. Higher machinery costs for conservation farming resulted principally from harvesting more hay. Expenditures for lime and fertilizer were greater for soil conserving than depleting farming because alfalfa required heavier applications than red clover and timothy.

Net Income. When all crops were sold, net income calculations for "soil depleting farming" were $506, or $.77 per hour of labor. "Conservation farming with corn" gave $1711 net income, or $1.87 per hour of labor. Table 5. A large part of this difference of $1205 was due to the application of more labor. On the basis of average labor requirements for producing crops in southeastern Ohio,[2] 263 hours of additional labor were needed to produce the greater income.

When all crops were sold, calculations for "conservation farming without corn" gave a net income of $1057, or $1.56 per hour of labor. This amount was $551 more than the net income from "soil depleting farming", and was produced with only 22 hours of additional labor. Returns per hour of labor were higher for "conservation farming with corn" than "conservation farming without corn" because 68 bushels of corn per acre gave higher returns per hour of labor than meadows cut for hay and sold.

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[2]Sitterley, J. H. Measures of Farm Work, Rates of Performance and Time Requirements for Common Farm Operations and Tasks. Ohio State University and Ohio Agricultural Experiment Station, Dept. of Agric. Economics and Rural Sociology, Mimeo. Bulletin #221, October, 1950.

Net income from additional forage depends upon utilization. If no hay were harvested and the entire top growth of meadows plowed under, increases in net income from conservation farming would be considerably less. For example, if corn and wheat were the only source of income for the 120 acre farm, "soil depleting farming" would produce a net income of only $33, or $.07 per hour of labor. "Conservation farming with corn" would give a net income of only $359 or $.72 per hour of labor. Under these conditions conservation farming would produce only $326 more net income than "soil depleting farming." "Conservation farming without corn" would produce no net income at all if the entire meadow growth was plowed down. Under these conditions the farmer would not only receive nothing for his labor, but he also would lose $452.

NET INCOME WHEN FORAGE WAS FED TO DAIRY COWS AVERAGING 5000 POUNDS OF MILK FOR SALE

Calculations in Table 6 show the economics of conservation farming when forage was assumed to be fed to dairy cows averaging 5000 pounds of milk for sale. This level of milk sales was selected for study because it represented the average per cow for Coshocton County. Below average cows would produce returns somewhat less than calculated in this study. Feed production for this type of farming was based on crop data for the 120 acre farm in Table 3.

Dairying was the principal livestock enterprise on the 55 farms. It provided a (1) dependable market for forage, and (2) sufficient volume of business to utilize all available labor. However, calculations showed that low producing dairy cows may prevent some farmers from using more forage profitably. Under these conditions the farmer may be more interested in conservation farming from the standpoint of producing more grain rather than more hay and pasture.

Capital Requirements. Calculations for the dairy farm with cows producing 5000 pounds of milk showed the following capital needs: "soil depleting farming", $11,100; "conservation farming with corn", $13,500; and "conservation farming without corn", $13,600. Table 6. The additional capital for conservation farming was needed for more livestock and remodeling of buildings. On most farms in this study, present barn arrangements were adequate for only about 12 dairy cows and necessary replacements. Therefore, to keep more dairy cows under conservation farming would require some remodeling of buildings. Lower machinery investments were calculated for "conservation farming without corn" because no equipment was needed for this grain crop.

TABLE 6.—Investment, Receipts, Expenses and Income for a 120-acre Dairy Farm With Soil Depleting and Conserving Farming

(Based on the sale of 5000 lbs. of milk per cow and average prices for the period 1943-52)

	"Soil Depleting Farming"	"Conservation Farming"	
		With Corn"	Without Corn"
	Dollars	Dollars	Dollars
Capital Investment			
Land	2,000	2,000	2,000
Buildings and fences	3,500	5,000	5,000
Machinery	3,500	3,500	3,000
Livestock	2,100	3,000	3,600
Total	11,100	13,500	13,600
Receipts			
Dairy	2,580	3,680	4,400
Hogs	824	1,311	0
Wheat	496	543	764
Total	3,900	5,534	5,164
Expenses			
Feed	424	483	991
Machinery	501	609	355
Lime and fertilizer	201	473	473
Seed	173	181	172
Taxes and insurance	121	150	154
Depreciation and repair of buildings	175	250	250
Interest on investment	444	540	544
Miscellaneous	200	290	320
Total	2,239	2,976	3,259
Labor Income	1,661	2,558	1,905
Return per Hour of Labor	.65	.72	.54
	Hours	Hours	Hours
Labor Required	2,557	3,555	3,503

Livestock Numbers. On the basis of average livestock feeding standards for Ohio,[3] soil conserving farming should support approximately one-half more livestock than soil depleting farming. Specifically, these livestock numbers were as follows: for "soil depleting farming", 12 dairy cows, 2 replacements to maturity and 22 market hogs;

[3]Sitterley, J. H. Rates of Feed Consumption by Livestock. Department of Rural Economics, Ohio State University, Extension Bulletin #308, May, 1949.

for "conservation farming with corn" 17 dairy cows, 3 replacements and 35 market hogs; and for "conservation farming without corn" 20 dairy cows, 4 replacements and no hogs. The number of dairy cows and replacements was determined from the amount of hay and pasture raised. The number of hogs was based on the amount of corn available after deducting the requirements for the dairy herd. Although a small flock of poultry was kept on most farms, this enterprise was omitted to simplify calculations. A couple hundred hens would not have changed conclusions because they would have been substituted for some of the hogs. Neither hogs nor poultry consume large amounts of forage. Wheat was the only crop sold.

Receipts. When forage was fed to cows averaging 5000 pounds of milk, calculations for "soil depleting farming" showed a gross income of $3900. "Conservation farming with corn" gave a gross income of $5534, or $1634 more than "soil depleting farming". Table 6.

When forage was fed to cows averaging 5000 pounds of milk, "conservation farming without corn" gave $5164 gross income, or $1264 more than "soil depleting farming". Table 6.

Prices used in calculating gross receipts were $3.80 per hundred pounds for milk after deducting hauling charges, $18.73 per hundred pounds for hogs, and $1.96 per bushel for wheat. All were averages received by Ohio farmers for the period 1943-52. Receipts from the dairy enterprise included the sale of milk and old cows.

Expenses. When forage was fed to cows averaging 5000 pounds of milk, calculated expenses were $2239 for "soil depleting farming", and $2976 for "conservation farming with corn". Table 6. Most of these additional expenses were for machinery, lime, fertilizer and overhead. For "conservation farming without corn" expenses were $3259. Most of these additional expenses above "soil depleting farming" were for feed, lime, fertilizer and overhead. Costs of using machinery were least under "conservation farming without corn", but the loss of the corn crop approximately doubled the cost of feed purchased. Machinery costs were based on the prevailing methods of growing and harvesting crops in the area studied.

Net Income. When forage was fed to cows averaging 5000 pounds of milk for sale, net income calculations for "soil depleting farming" were $1661, or $.65 per hour of labor. "Conservation farming with corn" gave $2558 net income, or $.72 per hour of labor. Table 6. A large part of this increase of $897 was due to the application of 998 hours of additional labor.

"Soil depleting farming" required only 2557 hours of labor compared with 3555 for "conservation farming with corn". If "conservation farming with corn" were adopted and only 2557 hours of labor used, calculations showed a net income of $2173, or $.85 per hour of labor. Under these conditions conservation farming would increase net income only $512. Most of this increase would come from the production of more grain. To maximize income under conservation farming would require 998 hours of additional labor above the 2557 hours needed for soil depleting farming. If this additional labor were used to care for cows averaging 5000 pounds of milk, it would increase net income only $385, which would be a return of only $.39 per hour of labor.

Some farmers in this study thought additional forage could not be fed profitably on their farms. Conditions similar to the dairy farm just described would lead to this conclusion. According to preceding calculations, if additional dairy cows would return an average of only $.39 per hour for labor, expansion of this enterprise would be unprofitable for most farmers. One possible exception would be where a farmer had a large supply of family labor that was not fully employed. In this case $.39 per hour for additional labor would add more to net income than no use of this labor.

When forage was fed to cows averaging 5000 pounds of milk, net income calculations for "conservation farming without corn" were $1905, or $.54 per hour of labor. This income, which was $244 greater than "soil depleting farming", resulted from the application of 946 hours of additional labor.

Suppose no more labor were used under "conservation farming without corn" than "soil depleting farming". Under these conditions the amount of livestock kept would be limited by a labor supply of 2557 hours. Calculations on this basis gave a net income of $1457 or $.57 per hour of labor. Therefore, if no additional labor were used under "conservation farming without corn" net income would be $204 less than "soil depleting farming". "Conservation farming without corn" gave a smaller return per hour of labor than "soil depleting farming" because forage fed to low producing dairy cows was not as profitable as raising 46 bushels of corn per acre.

Feed requirements for dairy cows kept under soil depleting farming were based on the use of 2000 pounds of concentrates per cow of which 300 pounds were linseed oilmeal. For conservation farming, these concentrate requirements were 1700 pounds per cow of which 150 pounds were linseed oilmeal. Less concentrates were used under conservation farming because of the assumption that good alfalfa meadows

would be available instead of red clover and timothy. If conservation farming would not produce the quality of hay assumed, net income from this system of farming would be less than the calculated amounts.

NET INCOME WHEN FORAGE WAS FED TO DAIRY COWS AVERAGING 9000 POUNDS OF MILK FOR SALE

The following calculations show the importance of high producing livestock in maximizing net income from conservation farming when more meadows are raised. Computations were based on the same production data and prices used for low producing cows, but milk sales were calculated from an average of 9000 pounds per cow instead of 5000. High producing cows increased total capital requirements several hundred dollars above farming with poor cows because of the higher valuation per cow, but did not change the investment in land, buildings or machinery. Livestock numbers for farming with high producing cows were about 10 percent less than farming with low producing cows because of heavier feeding per animal.

Receipts. When forage was fed to cows averaging 9000 pounds of milk for sale, calculations for "soil depleting farming" showed a gross income of $5186. "Conservation farming with corn" gave a gross income of $7140, or $1954 more than "soil depleting farming". Table 7.

When forage was fed to cows averaging 9000 pounds of milk, "conservation farming without corn" gave $7520 gross income, or $2334 more than "soil depleting farming". Table 7. Prices used in calculating these receipts were the same as used for the cows averaging 5000 pounds of milk.

Expenses. When forage was fed to cows averaging 9000 pounds of milk, calculated expenses were $2373 for "soil depleting farming"; $3057 for "conservation farming with corn"; and $3687 for "conservation farming without corn". Table 7. Expenses for the various items were approximately the same for farming with low and high producing cows, except for the amount of feed purchased. Concentrate requirements for the high producing cows were assumed to be 1000 pounds per cow greater than the amount used for the low producing cows. Therefore, more purchased feed was needed for the high producing cows. These higher concentrate requirements were as follows: for soil depleting farming, 3000 pounds per cow of which 470 was linseed oilmeal; for soil conserving farming, 2700 pounds per cow of which 230 was linseed oilmeal.

TABLE 7.—Investment, Receipts, Expenses and Income for a 120-acre Dairy Farm With Soil Depleting and Conserving Farming

(Based on the sale of 9000 lbs. of milk per cow and average prices for the period 1943-52)

	"Soil Depleting Farming"	"Conservation Farming"	
		With Corn"	Without Corn"
	Dollars	Dollars	Dollars
Capital Investment			
Land	2,000	2,000	2,000
Buildings and fences	3,500	5,000	5,000
Machinery	3,500	3,500	3,000
Livestock	2,600	3,600	4,400
Total	11,600	14,100	14,400
Receipts			
Dairy	4,062	5,580	6,756
Hogs	599	974	0
Wheat	525	586	764
Total	5,186	7,140	7,520
Expenses			
Feed	531	531	1,376
Machinery	501	609	355
Lime and fertilizer	201	473	473
Seed	173	181	172
Taxes and insurance	128	159	165
Depreciation and repair of buildings	175	250	250
Interest on investment	464	564	576
Miscellaneous	200	290	320
Total	2,373	3,057	3,687
Labor Income	2,813	4,083	3,833
Return per Hour of Labor	1.18	1.27	1.19
	Hours	Hours	Hours
Labor Required	2,381	3,221	3,223

Net Income. When forage was fed to cows averaging 9000 pounds of milk for sale, net income calculations for "soil depleting farming" were $2813, or $1.18 per hour of labor. "Conservation farming with corn" gave $4083 net income, or $1.27 per hour of labor. Table 7. More than half of this increase of $1270 was due to the application of 840 hours of additional labor.

For "soil depleting farming" labor requirements were only 2381 hours compared with 3221 for "conservation farming with corn". If "conservation farming with corn" were adopted and only 2381 hours of

labor used, calculations showed a net income of $3286, or $1.38 per hour of labor. Under these conditions conservation farming would increase net income only $473. Most of this increase would come from the production of more grain. To maximize net income under "conservation farming with corn" would require 840 hours of additional labor above the 2381 needed for "soil depleting farming". If this additional labor were used to care for cows averaging 9000 pounds of milk, it would increase net income $797, which would be a return of $.95 per hour of labor. This $.95 hourly return was smaller than the $1.38 return when only 2381 hours were used because forage fed to dairy cows returned less per hour of labor than 68 bushels of corn per acre.

More forage can increase volume of business profitably on many farms provided it is fed to high producing livestock. According to preceding calculations, farmers with high producing dairy cows could afford to hire additional labor beyond 2381 hours as long as it cost less than $.95 per hour. Although an expansion of the dairy enterprise might be profitable, some farmers often object to keeping more cows because of additional capital needed and risks involved.

When forage was fed to cows averaging 9000 pounds of milk, net income calculations for "conservation farming without corn" were $3833, or $1.19 per hour of labor. Table 7. This increase, which was $1020 greater than "soil depleting farming", came principally from the application of 842 hours of additional labor. Under "conservation farming without corn" 3223 hours were needed compared with 2381 for "soil depleting farming". If "conservation farming without corn" were adopted and only 2381 hours of labor used, net income would be $2905 and the return to labor $1.22 per hour. Under these conditions conservation farming would increase net income only $92.

"Conservation farming without corn" gave slightly higher returns per hour of labor than "soil depleting farming" because forage fed to high producing dairy cows returned more per hour of labor than 46 bushels of corn per acre. "Conservation farming without corn" gave smaller returns per hour of labor than "conservation farming with corn" because forage returned less per hour of labor than 68 bushels of corn per acre.

NET INCOME WHEN FORAGE WAS FED TO BEEF CATTLE

Calculations in Table 8 show the economics of conservation farming when forage was assumed to be fed to beef cattle. Feed production for this type of farming was based on crop data for the 120 acre farm described in Table 3. Beef farming was not found on any of the 55

farms of this size. Calculations for the 120 acre beef farm showed too small a volume of business for a full time operator, even under conservation farming. These computations also showed that beef farming required about twice as much land and capital as dairy farming to produce the same volume of business.

Capital Requirements. Calculations for the beef farm showed capital needs of $11,700 for "soil depleting farming"; $13,450 for "conservation farming with corn"; and $13,700 for "conservation farming without corn". More capital was needed for conservation farming because of additional livestock and remodeling of buildings.

Livestock Numbers. Computations showed that conservation farming should support about one-half more beef animals than soil depleting farming. Calculated livestock numbers were: 12 beef cows, 11 feeder cattle and 12 market hogs for "soil depleting farming"; 17 beef cows, 15 feeder cattle and 21 market hogs for "conservation farming with corn", and 20 beef cows, 18 feeder cattle and no hogs for "conservation farming without corn".

Receipts. When forage was fed to beef cattle, calculations for "soil depleting farming" showed a gross income of $2863. "Conservation farming with corn" gave a gross income of $3946, or $1083 more than "soil depleting farming". Table 8.

When forage was fed to beef cattle, "conservation farming without corn" gave $3821 gross income, or $958 more than "soil depleting farming". Receipts were calculated from the following prices, which were averages for the period 1943-52: beef cattle, $19.98 per hundred pounds; hogs $18.73 per hundred pounds; and wheat $1.96 per bushel.

Expenses. When forage was fed to beef cattle, calculated expenses were $1970 for "soil depleting farming"; $2631 for "conservation farming with corn"; and $3339 for "conservation farming without corn". Table 8. Expenses were higher for "conservation farming with corn" than "soil depleting farming" because of heavier applications of lime and fertilizer and a larger volume of business. A large share of the additional expenses for "conservation farming without corn" were for purchased feeds; a smaller amount was due to heavier expenditures for lime, fertilizer and a larger volume of business. "Conservation farming without corn" required the lowest machinery costs because of no expenditures for this grain crop.

Net Income. When forage was fed to beef cattle, net income calculations for "soil depleting farming" were $893, or $.78 per hour of labor. "Conservation farming with corn" gave a net income of $1315, or $.86 per hour of labor. Table 8. This difference of $422 was largely the result of using more labor. Under these conditions the

TABLE 8.—Investment, Receipts, Expenses and Income for a 120-acre Beef Farm With Soil Depleting and Conserving Farming

(Based on average prices for the period 1943-52)

	"Soil Depleting Farming"	"Conservation Farming"	
		With Corn"	Without Corn"
	Dollars	Dollars	Dollars
Capital Investment			
Land	2,000	2,000	2,000
Buildings and fences	3,500	4,000	4,000
Machinery	3,200	3,200	2,700
Livestock	3,000	4,250	5,000
Total	11,700	13,450	13,700
Receipts			
Beef	1,868	2,547	3,057
Hogs	450	787	0
Wheat	545	612	764
Total	2,863	3,946	3,821
Expenses			
Feed	186	275	1,221
Machinery	501	609	355
Lime and fertilizer	201	473	473
Seed	173	181	172
Taxes and insurance	131	155	160
Depreciation and repair of buildings	175	200	200
Interest on investment	468	538	548
Miscellaneous	135	200	210
Total	1,970	2,631	3,339
Labor Income	893	1,315	482
Return per Hour of Labor	.78	.86	.40
	Hours	Hours	Hours
Labor Required	1,145	1,536	1,211

principal gains from conservation farming were an increase in the volume of business. Only small gains came from increasing the return per hour of labor.

When forage was fed to beef cattle, net income calculations for "conservation farming without corn" were only $482 or $.40 per hour of labor. Table 8. This income was $411 less than the amount for "soil depleting farming", although 66 more hours of labor were needed. "Conservation farming without corn" produced less income than "soil depleting farming" because beef cattle did not return as much per hour of labor as 46 bushels of corn per acre.

Since labor requirements on the 120 acre beef farm were too low for a full time operator, a question might be asked regarding the amount of income that could be expected if a larger beef farm were used. Calculations also were made for a 240 acre beef farm which required approximately the same amount of labor as the 120 acre dairy farm. This size farm produced the following net incomes: "soil depleting farming" $2219, or $.97 per hour of labor; "conservation farming with corn" $3094, or $1.01 per hour of labor; and "conservation farming without corn" $1407, or $.58 per hour of labor. These calculations also showed that beef farming required about twice as much acreage and capital as dairy farming to produce the same volume of business.

Calculations for beef farming were based on efficient production. For example, beef production averaged about 180 pounds per acre of cropland and permanent pasture under "conservation farming with corn". This level of production was more nearly comparable with dairy cows averaging 9000 pounds of milk for sale than 5000. Calculations based on a lower production of beef per acre would give smaller returns than shown in this study.

ADDITIONAL ECONOMIC CONSIDERATIONS

Many economic aspects of conservation farming could not be discussed in detail. Therefore, this study was limited to a particular set of conditions. Only one conservation objective was studied; namely, the physical goal of controlling erosion and maintaining soil productivity. Conservation objectives might also be based on economic considerations. In this case the objective would be to apply conservation measures as long as the additional costs did not exceed the additional returns.

Only one soil association was considered. A study of certain other soils might have produced considerably different conclusions. Needed conservation practices vary according to soil type. On some soils good rotations and adequate amounts of lime and fertilizer are all that are needed. On other soils additional practices such as terracing and contour strip cropping are needed to control erosion. Some soils require more forage crops than others. In some cases a shift from soil depleting to conserving rotations may require major changes in livestock to maximize farm income. This situation often occurs when large reductions are made in the acreage of grain.

Up to this point, no consideration was given to the economics of conservation farming when crops were harvested with modern farm machinery, except the hay crop when sold. Calculations based on the

use of modern harvesting methods showed approximately the same net income relationships as the older methods used in this study. Modern harvesting machinery reduced total labor requirements about 150 hours. They also reduced net income slightly because of higher machine costs. Returns per hour of labor were approximately the same regardless of the method of harvesting used. Although a corn picker reduced labor requirements approximately 50 percent, and machinery costs 20 percent below cutting with a binder and husking with a shredder, these savings were not large for the 120 acre farm because of the small acreage of corn. Harvesting wheat with a combine and baling the straw reduced labor requirements only about 10 percent, but increased machinery charges as much as 50 percent above cutting with a binder and threshing. Baling the straw was necessary to provide bedding when dairy cows were kept. Baling hay required approximately the same amount of labor and about 75 percent higher machinery costs than harvesting with a loader.

The question might be asked as to what net income would be under conservation farming if hay yields were assumed to be 4.0 tons per acre instead of 2.5 tons. Calculations on the basis of 4.0 tons per acre showed that when the hay crop was sold higher hay yields increased not only net income per farm, but also the average return per hour of labor. Under these conditions higher hay yields would be profitable assuming they could be obtained and harvested without loss.

Calculations also showed that when forage was fed to dairy cows, averaging 5000 and 9000 pounds of milk for sale, hay yields of 4.0 tons per acre instead of 2.5 tons increased net income for the farm, but decreased slightly the average return per hour of labor. This situation was the result of the shift from hogs to dairy cows and heavier expenditures for lime, fertilizer and harvesting the additional hay. Under these conditions 4.0 tons of hay per acre would be more desirable than 2.5 tons only if the farmer were willing to increase net income by taking less per hour of labor. With high producing dairy cows additional labor could be hired profitably to expand the dairy enterprise. When the additional 1.5 tons of hay per acre were fed to low producing dairy cows, increased returns from more forage were not enough to justify expenditures for additional labor. In the area studied, many farmers who produced as much as 2.5 tons of hay per acre did not have enough livestock to utilize all of the available forage.

No consideration was given to the economics of conservation farming during the transition period. On many farms several years are required to maximize net income after conservation farming is adopted.

For example, costs of liming cropland for alfalfa are not recovered by many farmers until a crop can be raised and marketed through livestock. Alfalfa meadows cannot be expected to increase corn yields until sufficient time has elapsed to raise them and then plow the residues under. In the meantime current operating expenses may increase more than gross receipts and thereby reduce net income. Expenditures for housing additional livestock to consume more hay and pasture are often made in large amounts and cannot be recovered completely for several years.

The cumulative effects of soil depleting and conserving farming were not discussed in this study. Over a long period of time returns from conservation farming might be greater than the amount calculated. Also, returns from soil depleting farming might be somewhat less if continued for a long period of time. No consideration was given to possible increases in land values because of conservation farming. Accurate estimates could not be made because sale value often depends upon many factors besides soil productivity.

This study does not show the economics of conservation farming for different size farms. Larger farms should provide a more efficient use of machinery and overhead items than smaller farms. Larger farms operated with the labor of only one man could often produce a higher net income and return per hour of labor than 120 acres because more corn could be raised. However, more capital would be required. Smaller farms operated with the labor of only one man could often reduce net income and the return per hour of labor below 120 acres because of a smaller acreage of corn. These conclusions would hold under conditions where corn returned more per hour of labor than forage crops.

No consideration was given to different price relationships. Whenever price relationships change, new calculations are necessary to determine the economics of soil conservation. For example, if the cost of lime or fertilizer increases relative to product prices and other farm costs, profits will be maximized by using less lime and fertilizer. Likewise, if costs of these items decline relative to other expenses, profits will be maximized by using more of these factors and less of others. No consideration was given to the possibility that if many farmers increased livestock numbers to consume more hay and pasture, prices of milk and beef would probably decline to unprofitable levels for many producers.

Differences in income between soil depleting and conserving farming might have been greater if a more depleting group of practices had been used for comparison. However, the results would have applied to a smaller number of farms.

SUMMARY

Net income from soil conservation practices used on Muskingum and associated soils is influenced by (1) disposition of crops, (2) type of livestock and (3) efficiency of forage consuming animals. These conclusions are based on budgetary calculations which permitted holding constant all factors except the amount of conservation practices applied. Production data for these computations were obtained from a survey of 55 farms in Coshocton County during 1952. Prices used were averages for the period 1943-52.

Muskingum and associated soils cover about one-half of southeastern Ohio. They erode easily when cropped because slopes range from 10-30 percent. On much of the cropland one-half to three-fourths of the original topsoil has been lost because of the past land management.

Costs and returns for a group of soil depleting practices were compared with two different groups of soil conserving practices. The group of soil depleting practices included red clover and timothy meadows, no contour strip cropping, small amounts of lime and fertilizer on the cropland and no permanent pasture improvement.

One group of conservation practices included a rotation of corn, wheat and two years of alfalfa-grass meadow supplemented with contour strip cropping. The other group of conservation practices included a rotation of wheat and three years of alfalfa-grass meadow with no contour strip cropping. Both of these groups of conservation practices also included liberal applications of lime and fertilizer on the cropland and permanent pasture.

Capital requirements, labor needed and net income for these groups of practices were calculated for 120 acres under three types of farming: (1) a crop farm with no livestock, (2) a dairy farm with two different levels of milk production and (3) a beef cattle farm.

Calculations showed that both groups of conservation practices would support approximately one-half more livestock than the soil depleting practices, but net income from additional forage would be low if fed to inefficient animals.

Computations also showed two ways that conservation farming could increase net income. One was by producing higher returns per hour of labor. The other was by providing more hours of work.

When all crops were sold, net income calculations showed $506 for "soil depleting farming" and $1711 for "conservation farming with corn". Under these conditions conservation farming increased net income $1205, but required 263 hours of additional labor. Capital needs remained unchanged.

When all crops were sold, "conservation farming without corn" gave a net income of $1057 or $551 more than "soil depleting farming". This increase came from 22 hours of additional labor and $500 less capital.

When forage was fed to dairy cows producing 5000 pounds of milk for sale, net income calculations were $1661 for "soil depleting farming" and $2558 for "conservation farming with corn". Under these conditions, conservation farming increased net income $897, but required 998 hours of additional labor and $2400 more capital.

When forage was fed to cows producing 5000 pounds of milk, "conservation farming without corn" gave a net income of $1905 or $244 more than "soil depleting farming". This increase came from 946 hours of additional labor and $2500 more capital.

When forage was fed to dairy cows producing 9000 pounds of milk for sale, net income calculations were $2813 for "soil depleting farming" and $4083 for "conservation farming with corn". Under these conditions conservation farming increased net income $1270, but required 840 hours of additional labor and $2500 more capital.

When forage was fed to cows producing 9000 pounds of milk, "conservation farming without corn" produced a net income of $3833 or $1020 more than "soil depleting farming". This increase came from 842 hours of additional labor and $2800 more capital.

When forage was fed to beef cattle, net income calculations were $893 for "soil depleting farming" and $1315 for "conservation farming with corn". Under these conditions conservation farming increased net income $422, but required 391 hours of additional labor and $1750 more capital.

When forage was fed to beef cattle, "conservation farming without corn" gave a net income of $482 or $411 less than "soil depleting farming". This decrease resulted even after using 66 hours of additional labor and $2000 more capital.

Potential returns from pasturing meadows after the first cutting of hay were reduced when contour strip cropping was followed. On almost every farm in this study no pasturing was done on the contoured meadow strips when they were adjacent to corn. Lack of water and inconvenience were the principal reasons given for not pasturing these strips. Although forage could be harvested by machinery and fed during the summer, this method is usually more costly than pasturing.

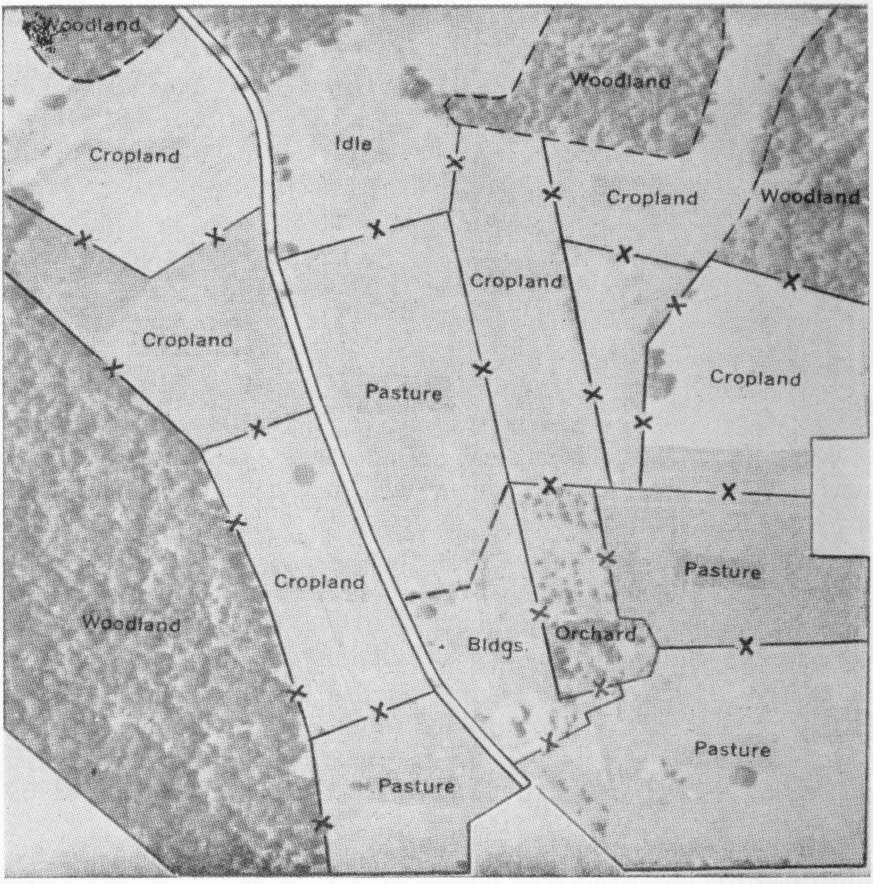

Fig. 1.—Field arrangement and land use on one of the farms before needed erosion control practices were adopted. Fields were farmed without regard to the contour of the land. Some of the cropland also was too steep for cultivated crops even if contour farming had been practiced.

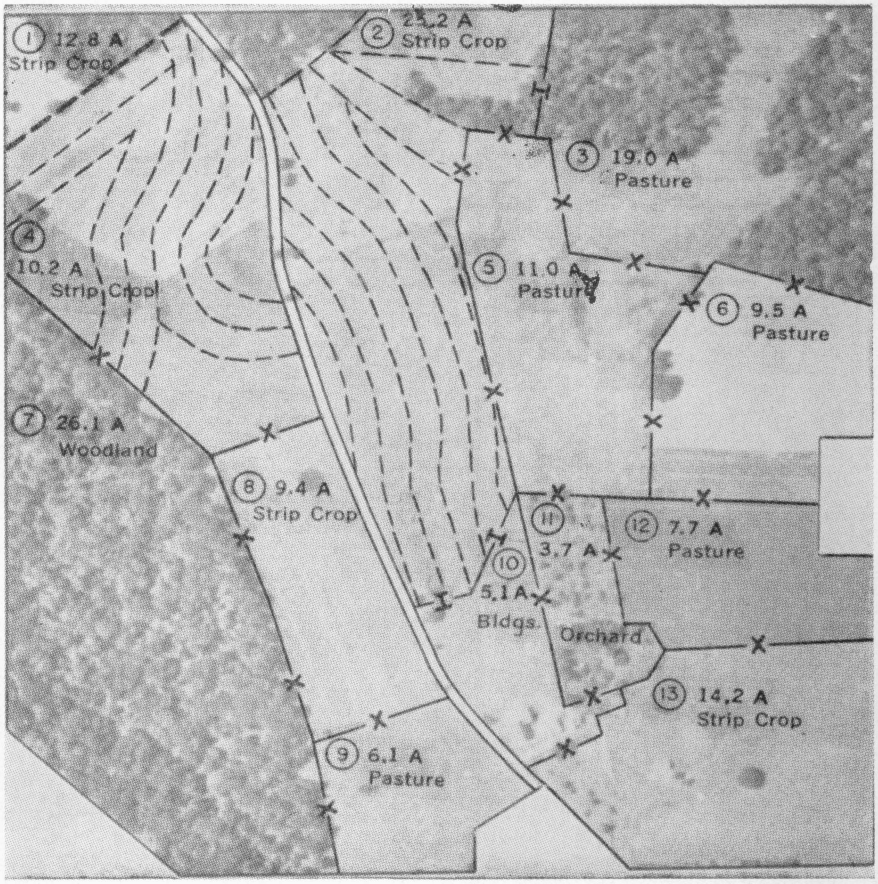

Fig. 2.—Field arrangement and land use on this same farm after adoption of the recommendations made by the local soil conservation district. All cropland has been contour stripped. However, strips have been drawn on only two of the fields to show how this practice looks in the area studied. Some of the steep cropland was shifted to permanent pasture; some of the gently sloping permanent pasture was shifted to cultivated crops.